JAO2373

[DOCUMENT] SPECIFICATION

[TITLE OF THE INVENTION]

INFORMATION PROCESSING APPARATUS

[WHAT IS CLAIMED IS]

[claim 1]

An information processing apparatus comprising:

image input means for inputting images;

designation means for designating one or more images among the images input through the image input means;

display control means having said one or more images designated by the designation means be displayed on predetermined areas of a screen; and

dividing means for dividing the screen into a plurality of display areas according to the number of the images designated by the designation means, wherein the display control means has each of the images designated by the designation means be displayed on one of the display areas divided by the dividing means.

[claim 2]

The information processing apparatus according to claim 1, wherein the display control means has the designated images be displayed on the divided display areas in reduced size.

[claim 3]

The information processing apparatus according to claim 1 or 2, wherein the dividing means divides the screen so that the aspect ratio of the divided display areas becomes equal to the aspect ratio of the designated images.

[claim 4]

The information processing apparatus according to claim 1, 2, or 3, wherein the dividing means divides the screen into n^2 areas when the number of the designated images is greater than $(n-1)^2$ and equal to or less than n_2.

[claim 5]

The information processing apparatus according to any of claims 1 through 4, wherein the designation means prohibits images from being designated exceeding a predetermined number.

[claim 6]

The information processing apparatus according to any of claims 1 through 5, further comprising selection means for selecting one of the images displayed on the divided display areas, wherein the display control means has the selected image be displayed in the entire area of the screen.

[claim 7]

The information processing apparatus according to any of claims 1 through 6, further comprising sound input means for inputting prescribed sound, wherein the designation means designates one or more images and the sound input through the sound input means.

[claim 8]

The information processing apparatus according to claim 7, wherein when images have been designated by the designation means, and when sounds associated with the images have been input through the sound input means, then the display control means has the designated images be displayed in the display areas of the screen together with a symbol indicating the existence of the sound input associated with the images.

[claim 9]

The information processing apparatus according to claim 7 or 8, wherein when sound have been designated by the designation means, and when there is no image associated with the sound, then the display control means has a symbol corresponding to the designated sound be displayed on the display area.

[claim 10]

The information processing apparatus according to claim 7, 8 or 9, further comprising sound playback means for playing back the sound, wherein when the image selected by the selection means has corresponding sound, then the display control means has the

selected image be displayed in the entire area of the screen, while the sound playback means reproduces the corresponding sound.

[claim 11]

The information processing apparatus according to claim 1, 2 or 3, wherein when the number of the images designated by the designation means is greater than n^2, the dividing means divides the screen into n^2 display areas, and the display control means has n^2 images, among the designated images, be displayed in the divided display areas.

[claim 12]

The information processing apparatus according to any of claims 1 through 11, wherein when the designation means designates multiple images, the designated images are displayed on the screen in a reduced size, the size of the divided display area being larger than the size of the reduced image.

[claim 13]

The information processing apparatus according to any of claims 1 through 12, further comprising line-drawing input means for inputting line drawings, wherein when the images designated by the designation means has corresponding line-drawings input through the line-drawing input means, then the display control means has the designated images and the line-drawings be displayed on the screen superimposing the line-drawings on the corresponding images.

[claim 14]

The information processing apparatus according to any of claims 1 through 13, further comprising display means for displaying the images.

[claim 15]

The information processing apparatus according to claim 11, wherein the display control means has the first n^2 images or last n^2 images, among the designated images, be displayed on the divided display areas.

[claim 16]

The information processing apparatus according to claim 4, 11, or 15, wherein "n" is a natural number.

[claim 17]

An information processing apparatus comprising:

image input means for inputting images;

designation means for designating one or more images input through the image input means; and

display control means for controlling the display size of the images according to the number of the images designated by the designation means.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[FIELD OF THE INVENTION]

This invention relates to an information processing apparatus, and more particularly, to an information processing apparatus which is capable of efficiently displaying a plurality of images on a screen by dividing the screen into a plurality of areas corresponding to the number of the images to be displayed.

[0002]

[RELATED ART]

Recently, electronic cameras using, for example, a CCD have been used in place of cameras using a film. In such electronic cameras, the image captured through the CCD is converted to digital data and recorded in a built-in memory or a detachable memory card. The image photographed by the electronic camera can be immediately reproduced and displayed on the screen of LCD or CRT, without conducting development and printing, unlike a conventional film-type camera.

[0003]

Some electronic cameras are capable of accepting audio data or hand-written memo input by users, and of displaying multiple images on the screen at the same time by dividing the screen area. In addition, a technique for storing the audio data or hand-written memo in association with the image has been proposed. This allows users to record surrounding sound during the photographing, or to record hand-written comments on the photographed place or objects.

Furthermore, users can select a desired image from the multiple images simultaneously displayed on the screen and display the selected image on the entire area of the screen.

[0004]

[Problems to be Solved]

However, when displaying a plurality of images on the screen of a conventional electronic camera, the number of divided areas and the size of each area are fixed in advance, and users can not flexibly display multiple images on the screen.

[0005]

For example, if a user wants to display four images on the screen using an electronic camera capable of dividing the screen into nine areas and displaying up to nine images, then the first four areas among the nine areas are used for displaying the images, and the rest of the areas do not bear any images. If this is the case, dividing the screen into four is much more efficient.

[0006]

Furthermore, there is another problem in an electronic camera capable of recording sound or memorandums other than images. Because users may want to display a plurality of images together with the associated information, such as hand-written memo, how and where to display such associated information on the divided screen must be determined in advance.

[0007]

This invention was conceived to overcome these problems, and aims to provide an information processing apparatus which is capable of displaying a plurality of images on a screen in an efficient manner.

[0008]

[Means for Solving the Problems]

To achieve the object, the information processing apparatus comprises image input means (e.g., CCD 20 in Fig. 4) for inputting images, designation means (e.g., touch tablet 6A and pen 41 in Fig. 2) for designating one or more images among the images input through the image input means, display control means (e.g., CPU 39

in Fig. 6) for having said one or more images designated by the designation means be displayed on predetermined areas of a screen, and dividing means (e.g., CPU 39 in Fig. 6) for dividing the screen into a plurality of display areas according to the number of the images designated by the designation means. The display control means have each of the images designated by the designation means be displayed on one of the display areas divided by the dividing means.

[0009]

The display control means may have the designated images be displayed on the divided display areas reducing in size.

[0010]

The dividing means divide the screen so that the aspect ratio of the divided display areas becomes equal to the aspect ratio of the designated images.

[0011]

The dividing means may divide the screen into n^2 areas when the number of the designated images is greater than $(n-1)^2$ and equal to or less than n_2.

[0012]

The designation means may prohibit a user from designating images exceeding a predetermined number.

[0013]

The information processing apparatus may further comprise selection means (e.g., touch tables 6A and pen 41 in Fig. 2) for selecting one of the images displayed on the divided display areas. When an image is selected, the display control means have the selected image be displayed in the entire area of the screen.

[0014]

The information processing apparatus may further comprise sound input means (e.g., microphone 8 in Fig. 1) for inputting prescribed sound. The designation means may designate one or more images and the sound input through the sound input means.

[0015]

When images are designated by the designation means, and when the designated images have associated sound input through the sound input means, then the display control means have the designated images be displayed in the display areas of the screen together with a symbol indicating that there is sound input associated with the images.

[0016]

When sound is designated by the designation means, and when there is no image associated with the designated sound, then the display control means have a symbol corresponding to the designated sound be displayed on the display area.

[0017]

The information processing apparatus may further comprise sound playback means (e.g., CPU 39 in Fig. 6) for playing back the sound. When the image selected by the selection means has corresponding sound, then the display control means have the selected image be displayed in the entire area of the screen, while the sound playback means reproduce the corresponding sound.

[0018]

If the number of the images designated by the designation means is greater than n^2, then the dividing means divide the screen into n^2 display areas, and the display control means have n^2 images among the designated images be displayed in the divided display areas.

[0019]

When the designation means designate images, the designated images are displayed on the screen in a reduced size. The size of the divided display area is larger than the size of the reduced image.

[0020]

The information processing apparatus may further comprise line-drawing input means (e.g., touch tablet 6A and pen 41 in Fig. 2) for inputting line-drawings. When the images designated by the designation means have corresponding line-drawings input through the line cut input means, then the display control means have the

designated images and the line-drawings be displayed on the screen so that the line-drawings are superimposed on the corresponding images.

[0021]

The information processing apparatus may further comprises display means (e.g., LCD 6 in Fig. 2) for displaying the images.

[0022]

The display control means may have first n^2 images or last n^2 images among the designated images be displayed on the divided display areas.

[0023]

The number "n" is a natural number.

[0024]

In another aspect of the invention, an information processing apparatus is provided which comprises image input means (e.g., CCD 20 in Fig. 4) for inputting images, designation means (e.g., touch tablet 6A and pen 41 in Fig. 41) for designating one or more images input through the image input means, and display control means (e.g., CPU 39 in Fig. 6) for controlling the display size of the images according to the number of the images designated by the designation means .

[0025]

In the information processing apparatus of the first embodiment (claim 1), the designation means designates one or more images among the images input through the image input means. The designated one or more images are displayed on predetermined areas of the screen through the display control means, while the screen is divided into a plurality of display areas according to the number of the designated images. At this time, the display control means has each of the designated images be displayed on one of the divided display areas.

[0026]

In the information processing apparatus of the second embodiment (claim 17), the designation means designates one of more images among the images input through the image input means, and

the display control means controls the display size of the images according to the number of the designated images.

[0027]

[Preferred Embodiments]

The preferred embodiments of the invention will be described in more detail referring to the drawings.

[0028]

Figs. 1 and 2 are perspective views of examples of an electronic camera to which the present invention is applied in accordance with the embodiment. In this embodiment, the camera surface facing the object is referred to as "Face X1", and the surface closer to the user is referred to as "Face X2". A finder 2 for confirmation of the photographing scope of the object, a photographic lens 3 for taking in the optical image of the object, and a flash (strobe) lamp 4 for emitting light to illuminate the object are provided on the top of Face X1.

[0029]

The Face X1 also includes a red-eye reduction LED 15 fired prior to flashing the strobe lamp 4 to reduce the red-eye phenomena, a photometric element 16 performing photometry when the CCD 20 (Fig. 4) is not activated, and a color measuring element 17 measuring the color level when the CCD 20 is not activated.

[0030]

The Face X2, which is the opposite side of Face X1, is provided with a finder 2 and a speaker 5 for outputting the sound recorded in the electronic camera 1 at the top portion thereof (corresponding to the top of Face X1 in which the finder 2, photographic lens 3 and flash lamp 4 are provided). LCD 6 and operation keys 7 formed in Face X2 are positioned below the top part in which the finder 2, photographic lens 3, flash lamp 4 and speaker 5 are provided. A touch tablet 6A is provided on the surface of the LCD 6 so that position data is output corresponding to the position designated through contact of the pen-type designator, which will be described below.

[0031]

The touch tablet 6A is made of transparent material, such as glass or resin, so that the user can see the image displayed on the LCD 6 formed inside the touch tablet 6A.

[0032]

The operation keys 7 are used, for example, when reproducing the recorded data and displaying it on the LCD 6. The operation (input) through the operation keys 7 by the user is detected, and the detection result is supplied to the CPU 39 (Fig. 6).

[0033]

Among the operation keys 7, menu key 7A is used to display the menu screen on the LCD 6, and execution key is operated to reproduce the recorded information selected by the user.

[0034]

Cancel key 7C is used when cancelling the reproduction process of the recorded information, and delete key is operated for deleting the recorded information. Scroll key 7E-7H are used to scroll the screen up and down when the list of the recorded information is displayed on the LCD 6.

[0035]

A slidable LCD cover 14 is also provided on Face X2 to protect the LCD 6 when it is not in use. The LCD cover 14 is slidable in the longitudinal direction of Face X2, and it covers the LCD 6 and the touch tablet 6A in the protective position, as shown in Fig. 3. When the LCD cover 14 is slid down, the LCD 6 and the touch tablet 6A are exposed, and at the same time, the arm 14A of the LCD cover 14 turns on the power source switch 11 (described below) formed on Face Y2.

[0036]

The top surface of the electronic camera 1 is referred to as Face Z, in which a microphone 8 for collecting sound and an earphone jack 9 for connection with an earphone (not shown) are provided.

[0037]

Face Y1, which is located in the left seeing from the front Face X1, has a release switch 10 operated when photographing the

object and a continuous photographic mode changeover switch 13 for changing over the continuous photographic mode during photographing. The release switch 11 and the continuous photographic mode changeover switch 13 are positioned below the finder 2, photographic lens 3 and flash lamp 4 provided on the top part of Face X1.

[0038]

Face Y2, which is the opposite side of Face Y1 (located in the right seeing from the front Face X1), has a recording switch 12 for recording sound and a power source switch 11. Similar to the release switch 10 and continuous photographing mode changeover switch 13 formed on Face F1, the recording switch 12 and power source switch 11 are also positioned below the finder 2, photographic lens 3 and flash lamp 4 formed on the top part of Face X1. The recording switch 12 is formed at substantially the same level as the release switch 10 in the symmetrical manner so that the camera can be hold by the user with either hands without inconvenience.

[0039]

The positional levels of the recording switch 12 and release switch 10 may be differed. If this is the case, even if the user depresses one of the switches and strongly supports the opposite face of the camera with the fingers against the depressing force, a situation in which the other switched is depressed by mistake can be avoided.

[0040]

The continuous photographing mode changeover switch 13 allows the user to switch over the photographing modes between a single frame photographing and multiple frame photographing (continuous photographing using a plurality of frames). If the pointer of the switch 13 is positioned at "S" (S mode), photographing is performed for a single frame upon depressing the release switch 10.

[0041]

If the release switch 10 is depressed in the state in which the indicator of the continuous photographing mode changeover

switch 13 is positioned at position "L" (L mode), then photographing is performed for eight frames a second during the depression of the release switch 10. This is called a low-speed continuous photographing mode.

[0042]

If the release switch 10 is depressed in the state in which the indicator of the continuous photographing mode changeover switch 13 is positioned at position "H" (H mode), then photographing is performed for thirty frames a second during the depression of the release switch 10. This is called a high-speed continuous photographing mode.

[0043]

Fig. 4 shows the interior structure of the electronic camera 1 shown in Figs. 1 and 2. CCD 20 is provided behind the photographic lens 3 (closer to Face X2), and converts the optical image formed through the photographic lens 3 into electric signals through photoelectric conversion.

[0044]

Indicator 26 is provided within the finder frame, i.e., within the viewing field of the finder 2, to indicate the current state of each function of the camera 1 to the user who is watching the object through the finder 2.

[0045]

Below the LCD 6, four cylindrical batteries (AA dry cells) 21 are inserted vertically in parallel, and electric charge stored in the batteries 21 is supplied to each unit of the camera 1. Capacitor 22, which stores electric charge for flash firing of the flash lamp 4, is positioned below the LCD 6.

[0046]

The electronic camera 1 has a circuit board 23 deeply inside, on which various control circuits are formed to control each part of the electronic camera 1. A removable memory card 24 is inserted between the circuit board 23, and the LCD 6 and batteries 21. Various information input to the electronic camera 1 is recorded in predetermined areas of the memory card 24.

[0047]

LCD switch 25 is positioned adjacent to the power source switch 11. The LCD switch 25 is turned on only when switch lever is depressed downward. When the LCD cover 14 is slid downward, the arm 14A od the LCD cover 14 pushes the LCD switch 25 and the power source switch 11 downward to turn them on.

[0048]

When the LCD cover 14 is positioned upward, the power source switch 11 is manually operated by the user, separately from the LCD switch 25. For example, when the electronic camera 1 is not in use and the LCD cover 14 is at the closed position, both the power source switch 11 and the LCD switch 25 are in the OFF state, as shown in Fig. 5(b). In this situation, if the user manually turns on the power source switch 11, then the power source switch 11 becomes in the ON state, while maintaining the LCD switch 25 in the OFF state, as shown in Fig. 5(c). On the other hand, when the LCD cover 14 is opened from the closed position of Fig. 5(b) (with the both switches off), then the power source switch 11 and the LCD switch 25 are turned on, as shown in Fig. 5(a). If the LCD cover 14 is closed in this state, only the LCD switch 25 is turned off (Fig. 5(c)).

[0049]

Although, in this embodiment, the memory card 24 is removable, a memory may be formed on the circuit board 23 so that various information can be recorded in the memory. The information recorded in the memory (or memory card 24) may be output through an interface (not shown) to, for example, an external personal computer.

[0050]

An example of the internal electric structure of the electronic camera 1 will be explained referring to the diagram of Fig. 6. The CCD 20 comprising a plurality of pixels performs photoelectric conversion to convert the optical image formed on each pixel to an image signal (electric signal). Digital signal processor (DSP) 33 supplies a CCD horizontal pulse to the CCD 20,

and at the same time, controls the CCD driving circuit 34 so that the CCD driving circuit 34 supplies a CCD vertical pulse to the CCD 20.

[0051]

Image processor 31, which is controlled by the CPU 39, samples the image signal photoelectrically converted by the CCD 20 in a predetermined timing and amplifies the sampled signal to a prescribed level. Analog-to-digital (A/D) converter 32 digitize the image signal sampled by the image processor 31 and supplies the digital signal to the DSP 33.

[0052]

The DSP 33 controls the data bus connected to the buffer memory 36 and memory card 24, so that the image data supplied to the DSP 33 from the A/D converter 32 is temporarily stored in the buffer memory 36, read out from the buffer memory 36, and then recorded in the memory card 24.

[0053]

The DSP 33 also has the image data supplied from the A/D converter 32 be stored in the frame memory 35 and displayed on the LCD 6. Furthermore, the DSP is adapted to read out the photographed image data from the memory card 24, expands the photographed image data, and has the expanded data be stored in the frame memory 35 and displayed on the LCD 6.

[0054]

When starting the electronic camera 1, the DSP 33 repeatedly activates the CCD 20, while adjusting the exposure time (exposure value), until the exposure level of the CCD 20 reaches a proper level. Alternatively, the DSP 33 may first activate the photometric circuit 51, and then calculate the initial value of the exposure time of CCD 20 in response to the photoreceptive level detected by the photometric element 16. This can reduce the exposure adjusting time of CCD 20.

[0055]

The DSP also controls data input/output timing, including data recording in the memory card 24 and storage of the expanded data in the buffer memory 36.

[0056]

The buffer memory 36 is used for eliminate the difference between the data input/output speed to/from the memory card 24 and the processing speed of the CPU 39 and DSP 33.

[0057]

Microphone 8 is used to input audio information (i.e., to collect sound). The audio information is supplied to the A/D and D/A converter 42.

[0058]

The A/D and D/A converter 42 converts the analog signal corresponding to the sound (voice) detected by the microphone 8 to a digital signal, and supplies the digital signal to the CPU 39. The A/D and D/A converter 42 also convert the digital signal supplied from the CPU 39 to an analog signal, and outputs the analog audio signal through the speaker 5.

[0059]

Photometric element 16 measures light quantity of the subject and the surroundings, and output the measurement result to the photometric circuit 51. The photometric circuit applies a prescribed process to the analog signal, which is the photometric result supplied by the photometric element 16, and then converts the processed analog signal to a digital signal for output to the CPU 39.

[0060]

Color measuring element 17 measures a color temperature of the object and the surroundings, and outputs the measurement result to the color measuring circuit 52. The color measuring circuit 52 applies a prescribed process to the analog signal, which is the color-measurement result supplied by the color measuring element 17, and then converts the processed analog signal to a digital signal for output to the CPU 39.

[0061]

Timer 45 has a built-in clock circuit to output the data representative of the current time to the CPU 39.

[0062]

Diaphragm driving circuit 53 is designed so as to set the aperture diameter of the diaphragm 54 to a predetermined value. The diaphragm 54 is positioned between the photographic lens 3 and the CCD 20, and alters the aperture of light entering the CCD through the photographic lens 3.

[0063]

The CPU 39 controls the actions of the photometric circuit 51 and the color measuring circuit 52 in response to the signal from the LCD switch 25. When the LCD cover 14 is open, the CPU 39 stops the operations of the photometric circuit 51 and the color measuring circuit 52. When the LCD cover 14 is open, the CPU 39 activates the photometric circuit 51 and the color measuring circuit 52, while suspending the action of the CCD 20 (e.g., action of the electronic shutter) until the release switch 10 reaches the half-depressed state.

[0064]

The CPU 39, during suspending the action of the CCD 20, controls the photometric circuit 51 and the color measuring circuit 52 and receives the photometric result of the photometric element 16 and the color measuring result of the color measuring element 17.

[0065]

Then, the CPU 39 calculates a white balance adjusting value corresponding to the color temperature supplied from the color measuring circuit, making reference to a prescribed table. The white balance adjusting value is supplied to the image processor 31.

[0066]

In other words, when the LCD cover 14 is closed, the CCD 20 is not activated because the LCD 6 is not used as an electronic viewfinder. Since the CCD 20 consumes a large amount of electric

power, suspending the operation of the CCD 20 contributes to power saving of the battery 21.

[0067]

When the LCD cover 14 is closed, the CPU 39 controls the image processor 31 not to execute processing until the release switch 10 is operated (until the release switch 10 reaches the half-depressed state).

[0068]

The CPU 39 also controls the diaphragm driving circuit 53, when the LCD cover 14 is closed, not to change the aperture diameter of the diaphragm 54 until the release switch 10 is operated (until the release switch 10 reaches the half-depressed state).

[0069]

The CPU controls the strobe driving circuit 37 to fire the strobe lamp 4 in appropriate timing, in addition to controlling the red-eye reduction LED driving circuit 38 to appropriately trigger the red-eye reduction LED 15 prior to firing the strobe lamp 4.

[0070]

When the LCD cover 14 is open, (i.e., when the electronic viewfinder is in use), the CPU 39 can prevent the strobe lamp 4 from being fired. This allows the object to be photographed in the same state as it is displayed in the electronic viewfinder.

[0071]

The CPU 39 records the information about the photographing date according to the time data supplied from the timer 45, as header information of the image data, in the photographed image recording area of the memory card 24. (That is, the photographed image data recorded in the photographed image recording area of the memory card 24 contains photographing time data.)

[0072]

After sound information is digitized and compressed, the CPU 39 has the compressed audio data be stored in the buffer memory 36 temporarily, then be recorded the audio data in a predetermined area (audio data recording area) of the memory card 24. At this

time, recording time data is recorded, as header information of audio data, in the audio recording area of the memory card 24.

[0073]

The CPU 39 controls the lens driving circuit 30 to appropriately move the photographic lens 3, thereby performing autofocus operations. The CPU 39 further controls the diaphragm driving circuit 53 to change the aperture diameter of the diaphragm 54 positioned between the photographic lens 3 and the CCD 20.

[0074]

The CPU controls the in-finder display circuit 40 to display the setting states of various actions on the in-finder display device 26.

[0075]

The CPU 39 executes prescribed data transmission/receipt to/from a given external equipment (not shown) through interface I/F 48.

[0076]

The CPU 39 receives signals from operation keys 7 and processes the signals appropriately.

[0077]

When touch tablet 6A is pushed through pen (pen-type pointing device) 41 operated by the user, the X-Y coordinates of the pushed position on the touch tablet 6A is read by the CPU 39. The coordinate data (which is memo information described below) is stored in the buffer memory 36. The CPU 39 reads out the memo information stored buffer memory 36, and records it together with header information of memo information input time in the memo information recording area of the memory card 24.

[0078]

Operations of the electronic camera 1 according to the embodiment will be described. First, explanation is made on the operation of the electronic viewfinder of LCD 6.

[0079]

When the user half-depresses the release switch 10, the DSP 33 determines whether or not the LCD cover 14 is open based on the

signal value supplied from the CPU 39, the signal value corresponding to the state of the LCD switch 25. If it is determined that the LCD cover 14 is closed, no electronic viewfinder operation is performed. If this is the case, the DSP 33 suspends processing until the release switch 10 is operated.

[0080]

Because electronic viewfinder operation is not executed when the LCD cover 14 is closed, the CPU 39 suspends the operations of the CCD 20, image processor 31 and diaphragm driving circuit 53. In this situation, the CPU 39 activates the photometric circuit 51 and color measuring circuit 52, and supplies the measurement results to the image processor 31. The image processor 31 uses the measurement results when controlling the white-balance or brightness.

[0081]

When the release switch is operated, then the CPU 39 activates the CCD 20 and the diaphragm driving circuit 53.

[0082]

On the other hand, if it is determined that the LCD cover 14 is open, then the CCD 20 performs an electronic shutter action every predetermined time for a predetermined exposure time, and photoelectrically converts the optical image of the object collected by the photographic lens 3 to an electric signal. The image signal obtained through the photoelectric conversion is output to the image processor 31.

[0083]

The image processor 31 controls the white balance and brightness. The image processor 31 applies a prescribed process to the image signal, and then outputs the image signal to the A/D converter 32. If the CCD 20 is being activated, then the image processor 31 uses an adjustment value calculated based on the output of the CCD 20 for controlling the white balance and brightness.

[0084]

The A/D converter 32 converts the analog image signal to digital image data, and output the digital data to the DSP 33.

[0085]

The DSP 33 output the digital image data to the frame memory 35 to have the LCD 6 display the image corresponding to the digital image data.

[0086]

Thus, when the LCD cover 14 is open in the electronic camera 1, the CCD 20 performs electronic shutter actions periodically. Every time the CCD 20 performs the shutter action, the signal output from the CCD 20 is converted to digital image data, which is then output to the frame memory 35 to have the LCD 6 continuously display the object image. This is the function of the electronic viewfinder.

[0087]

When the LCD cover 14 is closed, electronic viewfinder action is not executed. If this is the case, operations of the CCD 20, image processor 31, and diaphragm driving circuit 53 are suspended to save power consumption.

[0088]

Next, photographing operations using the apparatus of the invention will be described.

[0089]

First, explanation will be made on S mode photographing, in which the continuous photographing mode changeover switch 13 provided on Face Y1 is set to the S mode (photographing a single frame). The power source switch 11 shown in Fig. 1 is shifted to the "ON" side to turn on the power source of the electronic camera 1. The object can be checked through the finder 2 before the release switch 10 provided on Face Y1 is depressed. Photographing process starts upon depression of the release switch 10.

[0090]

If the LCD cover 14 is closed, the CPU 39 activates the CCD 20, image processor 31 and diaphragm driving circuit 53 again at the point of time when the release switch 10 is halfway depressed,

and starts the photographing process when the release switch reaches the full-depressed state.

[0091]

The optical image of the object observed through the finder 2 is collected by the photographic lens and is imaged on the CCD 20 comprising a plurality of pixels. The optical image formed on the CCD 20 is photoelectrically converted to an image signal at each pixel, and sampled by the image processor 31. The sampled image signal is supplied from the image processor 31 to the A/D converter 32 for digitization. The digital signal is output to the DSP 33.

[0092]

The DSP 33 feeds the digital image data to the buffer memory for temporary storage, reads the image data out of the buffer memory 36, and compress the data using the JPEG (Joint Photographic Experts Group) method combining discrete cosine transform (conversion), quantization and Huffman coding. The compressed data is recorded in the photographed image recording area of the memory card 24. At this time, data representing the photographing time is also recorded as head information of the photographed image data in the photographed image recording area of the memory card 24.

[0093]

Since the continuous photographing mode changeover switch 13 is set to the S mode, a single frame is used for photographing. Even if the release switch 10 is continuously depressed, the subsequent photographing is not performed. If the release switch 10 is continuously depressed with the LCD cover 14 open, the photographed image is displayed on the LCD 6.

[0094]

Second, explanation will be made on the case in which the continuous photographing mode changeover switch 13 is set to the L mode (continuously photographing 8 frames a second). Power source switch 11 is switched on to turn on the power source of the electronic camera 1, and then the release switch 10 provided on Face Y1 is depressed to start a photographing process.

[0095]

If the LCD cover 14 is closed, the CPU 39 activates the CCD 20, image processor 31 and diaphragm driving circuit 53 again at the point of time when the release switch 10 is halfway depressed, and starts the photographing process when the release switch reaches the full-depressed state.

[0096]

The optical image of the object observed through the finder 2 is collected by the photographic lens and is imaged on the CCD 20 comprising a plurality of pixels. The optical image formed on the CCD 20 is photoelectrically converted to an image signal at each pixel, and sampled by the image processor 31 eight times a second. At this time, the image processor 31 thins out three quarters of pixels from the image electric signals of the entire pixels of CCD 20.

[0097]

The image processor 31 divides the pixel matrix of the CCD 20 into multiple areas, each area consisting of 2X2 pixels (four pixels), as shown in Fig. 7. Among the four pixels composing an area, the image signal of a predetermined pixel is sampled, and the remaining three pixels are thinned out.

[0098]

For example, at the first sampling (for the first frame), the top left pixel "a" of each area is sampled, and the other pixels "b", "c" and "d" are thinned out. At the second sampling (for the second frame), the top right pixel "b" of each area is sampled, and the pixels "a", "c" and "d" are thinned out. At the third and fourth sampling, the bottom left pixel "c" and bottom right pixel "d" are sampled, respectively, and the other pixels are thinned out. In other words, each pixel is sampled every four frames.

[0099]

The image signals sampled by the image processor 31 (which are the signals of a quarter of the pixels of CCD 20) are supplied to the A/D converter 32 for digitization. The digital image data is output to the DSP 33.

[0100]

The DSP 33 outputs the digitized image signal to the buffer memory for temporary storage, then reads out the digital image signal, and compresses the digital signal using the JPEC method. The digitized and compressed image data is recorded in the photographed image recording area of the memory card 24. Data representing the photographing time is also recorded in the photographed image recording area of the memory card 24 as head information of the photographed image data.

[0101]

Third, explanation will be made on the case in which the continuous photographing mode changeover switch 13 is set to the H mode (continuously photographing 30 frames a second). Power source switch 11 is switched on to turn on the power source of the electronic camera 1, and then the release switch 10 provided on Face Y1 is depressed to start a photographing process.

[0102]

If the LCD cover 14 is closed, the CPU 39 activates the CCD 20, image processor 31 and diaphragm driving circuit 53 again at the point of time when the release switch 10 is halfway depressed, and starts the photographing process when the release switch reaches the full-depressed state.

[0103]

The optical image of the object observed through the finder 2 is collected by the photographic lens and is imaged on the CCD 20 comprising a plurality of pixels. The optical image formed on the CCD 20 is photoelectrically converted to an image signal at each pixel, and sampled by the image processor 31 thirty times a second. At this time, the image processor 31 thins out eight ninth (8/9) of pixels from the image electric signals of the entire pixels of CCD 20.

[0104]

The image processor 31 divides the pixel matrix of the CCD 20 into multiple areas, each area consisting of 3X3 pixels (nine pixels), as shown in Fig. 8. Among the nine pixels composing an area, the image signal of a predetermined pixel is sampled, and the

remaining eight pixels are thinned out. The sampling is performed 30 times a second.

[0105]

For example, at the first sampling (for the first frame), the top left pixel "a" of each area is sampled, and pixels "b" through "i" are thinned out. At the second sampling (for the second frame), the pixel "b" positioned on the right side of pixel "a" is sampled, while pixels "a" and "c"-"i" are thinned out. At the third and later sampling, pixel "c", "d" ... and "i" are sampled, respectively, and the other pixels are thinned out. In other words, each given pixel is sampled every four frames.

[0106]

The image signals sampled by the image processor 31 (which are the signals of one ninth of the pixels of CCD 20) are supplied to the A/D converter 32 for digitization. The digital image data is output to the DSP 33.

[0107]

The DSP 33 outputs the digitized image signal to the buffer memory for temporary storage, then reads out the digital image signal, and compresses the digital signal using the JPEC method. The digitized and compressed image data is recorded in the photographed image recording area of the memory card 24, together with head information representing the photographing date.

[0108]

Strobe lamp 4 may be activated to illuminate the object, as necessary. However, when the LCD cover 14 is open, that is, when the LCD 6 is conducting the electronic viewfinder operation, then the CPU 39 can control the strobe lamp 4 not to emit light.

[0109]

Next, explanation will be made on the operations performed when two-dimensional information (pen-input information) is input through the touch tablet 6A.

[0110]

When the touch tablet 6A is pushed by the tip of the pen 41, the X-Y coordinates of the contacted positions are input to the CPU

39. The X-Y coordinates are stored in the buffer memory. The data can also be written in the frame memory 35 at the position corresponding to that X-Y coordinates, thereby displaying the memo corresponding to dragging of the pen 41 on the X-Y coordinates of the LCD 6.

[0111]

As has been described, the touch tablet 6A is made of transparent material, and the user can observe the point displayed on the LCD 6 (corresponding to the position pushed by the tip of the pen 41) in real time. This allows the user to feel as if the user directly input the memo onto the LCD 6 using the pen. When the user moves the pen 41 on the touch tablet 6A, a line is displayed on the LCD 6 in response to the movement of the pen 41. If the pen 41 is moved off and on the touch tablet 6A, then a broken line is displayed on the LCD 6. Thus, the use can input desired memo information including any characters or drawings on the touch tablet 6A (LCD).

[0112]

If memo information is input through the pen 41 while displaying a photographed image on the LCD 6, the memo information and the photographed image information are composed in the frame memory 35, and displayed simultaneously on the LCD 6.

[0113]

The user can select the color of the memo among from black, white, red, blue, etc. by operating the pallet 100.

[0114]

After memo information is input through the pen 41 to the touch tablet 6A, when the execution key 7B of the operation keys 7 is pushed, then the memo information stored in the buffer memory 36 is supplied to the memory card 24 together with the header information representing the input time and recorded in the memo information recording area of the memory card 24.

[0115]

The memo information recorded on the memory card 24 must be subject to data compression. Because the memo information input to

the touch tablet 6A contains information having a high spacial frequency component, the amount of the memo information can not be adequately reduced by data compression using the JPEG method, which is used for compression of photographed image, with insufficient compression efficiency, and as a result, time taken for compression and expansion becomes long. Furthermore, since the JPEG compression is non-reversible compression, it is not suitable to compression of memo information that contains a small amount of information (because, when expanded and displayed on the LCD 6, gathering or blurring due to information gap becomes conspicuous.)

[0116]

Therefore, in this embodiment, memo information is compressed using the run-length coding method used in, for example, facsimile machines. Run-length coding is a method for compressing memo information by scanning the memo in the horizontal direction and coding the continuous lengths of the information areas (dots, points) of each color, such as black, white, red, blue, and the continuous lengths of the non-information areas (spaces without having pen input).

[0117]

Memo information can be compressed to minimum using the run-length method. Furthermore, during expansion of the compressed memo information, information gap can be suppressed. If the amount of memo information is very small, it may not be necessarily compressed.

[0118]

As has been described, when memo information is input through the pen 41 while displaying a photographed imaged on the LCD 6, then the photographed image data and the memo information are composed in the frame memory 35, and a composite image of the photographed image and the memo information is displayed on the LCD 6. Meanwhile, the photographed image data is recorded on the photographed image recording area of the memory card 24, while the memo information is recorded on the memo information recording area of the memory card 24. Because the two different types of

information items are recorded in the different areas, the user can delete one of the information (for example, memo information) from the composite image of the photographed image and the memo. In addition, each type of information can be compressed using an individual compression method.

[0119]

When data is recorded in the sound recording area, photographed image recording area, or memo information recording area, the list of the recorded data can be displayed on the LCD 6, as shown in Fig. 9.

[0120]

On the display screen of the LCD 6 of Fig. 9, the date of the information recording (e.g., November 1, 1996) is displayed on the top end of the screen, and information numbers recorded on that date and recording time are listed on the left side of the screen below the recording data.

[0121]

Thumbnail images are displayed on the right side of the recording time. The thumbnail images are created by thinning out (reducing) the bit map data of each photographed image data recorded in the memory card 24. In the list, those information bearing a thumbnail contain photographed image data. That is, the information input at 10:16 and 10:21 contain photographed image data, and the information input at other time do not contain image data.

[0122]

The memo icon (white square) indicates that a memo is recorded as line drawing information.

[0123]

On the right of the thumbnail, sound icon (music note) is displayed together with the sound recording time (unit is second). If there is no sound information input, then these items are not displayed.

[0124]

The use can select a desired sound icon from the list displayed on the LCD 6 by touching the icon with the pen 41. The

selected sound is reproduced by touching the execution key 7B (Fig. 2) with the tip of the pen 41.

[0125]

For example, if the sound icon of the first information recorded on "10:16" is touched by the pen 41, then the CPU 39 reads out the audio data corresponding to the recording time (10:16) from the memory card 24, expands the audio data, and supplies it to the A/D and D/A converter 42. The A/D and D/A converter 42 converts the supplied audio data to an analog signal and reproduces the sound through the speaker 5.

[0126]

When reproducing a photographed image recorded in the memory card 24, the user selects a desired thumbnail by touching it with the pen 41, and then push the execution key 7B for reproduction of the image.

[0127]

The CPU 39 instructs the DSP 33 to read out the photographed image data corresponding to the recording time of the selected thumbnail from the memory card 24. The DSP 33 expands the (compressed) photographed image data read out from the memory card 24, and has the expanded data be stored in the frame memory 35 as bit map data and be displayed on the LCD 6.

[0128]

The image photographed in the S mode is displayed on the LCD 6 as a still image. It is needless to say that the still image is reproduced by reproducing image signals of all of the pixels of the CCD 20.

[0129]

The images photographed in the L mode are continuously displayed on the LCD 6 at a rate of 8 frames a second. The number of pixels displayed in each frame is a quarter of the pixels of the CCD 20.

[0130]

Generally, human eyes sensitively react to the deterioration in the resolution of a still image, Therefore, if pixels are

thinned out in a still image, it is obviously noticed by users and regarded as deterioration of the image. However, if 8 frames are photographed a second in the L mode with high continuous photographing speed, and if those images are reproduced at a rate of 8 frames a second, then, the human eyes will observe 8 frames of images a second. As a result, although the number of pixels of each frame is a quarter of the pixels of the CCD 20, the information amount coming into the human eyes a second becomes double, as compared with a still image.

[0131]

Assuming that the number of pixels composing a frame of image photographed in the S mode is 1, then the number of pixels used for a frame of image photographed in the L mode becomes 1/4. When the image photographed in the S mode (still image) is displayed on the LCD 6, the information amount a second coming into the human eyes is 1=(1 pixel)X(1 frame). On the other hand, when the images photographed in the L mode are displayed on the LCD 6, then the information amount a second coming into the human eyes becomes 2=(1/4 pixels)X(8 frames). Thus, double amount of information reaches the human eyes. Therefore, even if the number of pixels is made 1/4, the user can observe the reproduced images without worrying the deterioration of the images.

[0132]

Furthermore, in the embodiment, different pixels are sampled and displayed on the LCD 6 for a different frame. This causes afterimages in the human eyes, and the user can see the images photographed in the L mode without worrying the inferiority in the images even if three quarters of pixels are thinned out each frame.

[0133]

The images photographed in the H mode are continuously displayed on the LCD 6 at a rate of 30 frames a second. At this time, the number of pixels displayed for each frame is one ninth of the total pixels of the CCD 20. However, for the same reason as the L mode, the user can see the H mode images reproduced on the LCD 6 without worrying the change in the image quality.

[0134]

In the embodiment, when photographing the object in the L and H modes, the image processor 31 thins out pixels of the CCD 20 so that the deterioration of the reproduced image quality is not noticed by the user. This can reduce the load on the DPS 33 and allow the DSP 33 to be activated at a low speed and with a low electric power. The cost of the apparatus and the power consumption can also be reduced.

[0135]

As has been described, in this embodiment, the apparatus is capable of not only photographing optical images of the object, but also recording memo (line drawing) information. The apparatus has the corresponding modes (photographing mode and memo input mode), which are appropriately selected through the user's operation, whereby information can be smoothly input to the apparatus.

[0136]

Fig. 10 shows another example of the display screen of the LCD 6 displaying the list of the information recorded in the memory card 24. The top left of the screen shows the recording date, followed by the recording list displayed in the time series manner. The list contains information number, recording time, memo icon, thumbnail image, sound icon, and sound recording time in this order from the left.

[0137]

Now, explanation will be made on a case in which a plurality of information of different recording time are selected and displayed on the screen by selecting the execution key 7B. For example, the information numbers 1 through 4 are picked up (selected) and displayed them on the screen by selecting the execution key 7B.

[0138]

Fig. 11 shows an example of the screen of the LCD 6 displaying the multiple selected information. The CPU 39 divides the screen of the LCD 6 into a plurality of areas based on the number of selected information. In this example, because four information,

three of which contain image data, are selected, the screen of the LCD 6 is divided into four. In this example, regarding the second information containing both image and sound information recorded, the CPU makes only the image be displayed on the screen, ignoring the sound. The CPU 39 also ignores the third information in which only sound information is recorded.

[0139]

The CPU 39 reads the image data corresponding to the thumbnail image of the first information out of the memory card 24, reduces the image in size by thinning out a portion of pixels so that it corresponds to the size (the number of pixels) of the divided screen area of the LCD 6, and writes it in the corresponding area of the frame memory 35.

[0140]

Then, the CPU 39 reads the image data corresponding to the thumbnail of the second information out of the memory card 24, reduces the size of the image in the same manner, and writes it in the corresponding part of the frame memory 35. Regarding the third information, since it contains only sound information, it is ignored.

[0141]

The image corresponding to the thumbnail image of the fourth information is read out from the memory card 24, reduced in size in the same manner, and written in the corresponding area in the frame memory.

[0142]

Thus, image A of the first information, image B of the second information, and image C of the fourth information are displayed in the divided area of the screen in the arrangement shown in Fig. 11.

[0143]

Fig. 12 shows another example of the screen of the LCD 6 displaying a plurality of information. The CPU 39 divides the screen of the LCD 6 into a plurality of areas based on the number of the selected information. The screen of the LCD 6 is divided into four because four information have been selected. In the

example, the CPU 39 has a symbol (e.g., music note) representing audio data be displayed as to the information containing sound information so as to indicate the existence of the sound information.

[0144]

The CPU 39 reads out the image corresponding to the thumbnail image of the first information from the memory card 24, reduces the image size by, for example, thinning out a portion of pixels to the extent of the size (the number of pixels) of the divided screen area of the LCD 6, and writes it in the corresponding area of the frame memory 35.

[0145]

Then, the CPU 39 reads the image corresponding to the thumbnail image of the second information out of the memory card 24, reduces the image in size in the same manner, writes it in the corresponding area of the frame memory 35. Since the second information contains sound information, a music note is written in the predetermined position of the frame memory to indicate the existence of sound information.

[0146]

The third information contains only sound information, and so, only a music note indicating the existence of sound information is written in the predetermined position of the frame memory 35.

[0147]

Finally, the image corresponding to the thumbnail image of the fourth information is read out from the memory card 24, reduced in the same manner, and written in the corresponding area of the frame memory 35.

[0148]

The four divided areas of the screen display image A of the first information, image B of the second information together with a music note, a music note corresponding to the third information, and image C of the fourth information, respectively, as shown in Fig. 12.

[0149]

Fig. 13 shows still another example of the screen of the LCD 6 displaying a plurality of information. The CPU 39 divides the screen of the LCD 6 into multiple areas based on the number of the selected information. The screen is divided into four based on the four selected information. In this example, the CPU 39 instructs so that no symbols are displayed in connection with sound information.

[0150]

The CPU 39 reads the image data corresponding to the thumbnail image of the first information out of the memory card 24, reduces the image in size by thinning out a portion of pixels so that it corresponds to the size (the number of pixels) of the divided screen area of the LCD 6, and writes it in the corresponding area of the frame memory 35.

[0151]

Then, the CPU 39 reads the image data corresponding to the thumbnail of the second information out of the memory card 24, reduces the size of the image in the same manner, and writes it in the corresponding part of the frame memory 35. Although the second information contains sound information, no symbol indicating the existence of the sound information is displayed in this example.

[0152]

Since the third information contains only sound information, nothing is written in the corresponding area of the frame memory 35.

[0153]

The image corresponding to the thumbnail image of the fourth information is read out from the memory card 24, reduced in size in the same manner, and written in the corresponding area in the frame memory.

[0154]

Thus, the four divided areas of the screen display image A of the first information, image B of the second information, a blank image indicating no photographed image but sound information

contained, and image C of the fourth information, respectively, as shown in Fig. 13.

[0155]

In the state in which the area-divided screen of the LCD 6 displays images as shown in Figs. 11-13, if the user selects, for example, image B using pen 41 and touches the execution key 7B, then the CPU 39 has the selected image B be displayed on the entire screen, as shown in Fig. 14. Since image B has associated sound information (See the list of Fig. 10), the CPU 39, after image B is displayed on the entire screen, reads the audio data from the memory card 24 and supplies it to the A/D and D/A converter 42. The A/D and D/A converter 42 converts the digital audio data supplied from the CPU 39 to an analog sound signal, and supplies the analog signal to the speaker 5. In this way, the sound associated with the image B displayed on the LCD 6 is output through the speaker 5.

[0156]

It is possible for the user to select five or more information from the list of Fig. 10. If the number of information selected by the user is 5 to 9, then the CPU 39 divides the screen of LCD 6 into nine areas. If ten information items are selected, the CPU 39 also divides the screen into nine, and has nine out of ten information be displayed on the screen. In view of the screen size of the LCD 6, if the screen is divided into ten or more areas, each area becomes too small to recognize the image displayed thereon. Therefore, in the embodiment, dividing the screen into nine is upper limit. If the screen size of the LCD 6 is adequately large, then the screen can be divided into ten or more areas.

[0157]

If an external device is connected to the CPU 39 through interface (I/F) 48 and information is displayed on the monitor of the external device, then the upper limit of the screen division is changed according to the monitor size.

[0158]

An example of screen display, when more than ten information items are selected from the list of Fig. 10, will be explained below.

[0159]

If twelve information A-L are selected from the list of Fig. 10, followed by selection of the execution key 7B, the CPU 39 determines that the dividing into nine is the upper limit for the LCD 6 and divides the screen of the LCD 6 into nine areas. The first nine information A-I, among the selected information, are sequentially displayed in the nine areas, as shown in Fig. 15. Then, if scroll key 7E is selected in this state, the CPU 39 controls the screen so that the displayed nine information items are moved up by one and information B-J appear on the nine areas, as shown in Fig. 16.

[0160]

If, in the state of Fig. 15 or 16, scroll key 7F is selected, the CPU 39 controls the screen so that the last nine information D-L, among the selected information A-L, are displayed. On the contrary, if scroll key 7G is selected in the state of Fig. 16, the CPU 39 controls the screen so that the nine information items are move down in the reverse order and information A-I are displayed on the screen, as in Fig. 15. If scroll key 7H is selected in the state of Fig. 17 or 16, the CPU 39 controls the screen so that the first nine information A-I among the selected information are displayed on the screen.

[0161]

Fig. 17 shows another example of screen display with more than ten information selected from the list of Fig. 10.

[0162]

If twelve information A-L are selected from the list of Fig. 10, followed by selection of the execution key 7B, the CPU 39 determines that the dividing into nine is the upper limit for the LCD 6 and divides the screen of the LCD 6 into nine areas. The CPU 39 has the last nine information A-I, among the selected information, be displayed sequentially in the nine areas, as shown

in Fig. 17. Display control using scroll keys is the same as the previous example, so the explanation is omitted.

[0163]

Regarding sound information, a music note may be displayed on the screen, or blank image may be displayed, or that information may be skipped without displaying anything. Figs. 15 and 16 show examples in which the total number of information selected to be displayed on the screen is ten or more, including sound information.

[0164]

If information that contains memo information is included in the multiple information selected by the user, it is possible for the apparatus to display the memo in the corresponding area of the divided screen. If memo information is stored in association with certain image information, the memo can be displayed being superimposed onto the photographed image in the corresponding area of the divided screen. If the selected information contains only memo information, the memo can be solely displayed without photographed image on the corresponding area of the divided screen.

[0165]

The size of the divided area of the screen can be set to larger than that of the thumbnail image shown in the list of Fig. 10. This prevents each image displayed on the divided area from becoming too small to recognize.

[0166]

Another embodiment of the invention will now be described. In this embodiment, the control operation of the CPU 39 is slightly different from the previous embodiment. The parts composing the electronic camera 1 are the same as the previous embodiment, and the explanation will be omitted. Only difference in the control action of the CPU 39 resides in information selection from the list of Fig. 10, and other operations are the same.

[0167]

The control operation of the CPU 39 for information selection from the list of Fig. 10 will be explained below.

[0168]

In the list of Fig. 10, information is selected by picking up desired numbers of information, for example, A, B and C. The CPU 39 controls this action so that up to nine information can be accepted. When the user selects the tenth information, the CPU 39 determines that the information can not be displayed on the screen because of the upper limit of the divided areas (9 areas) of the LCD 6 and does not accept the tenth selection.

[0169]

In this embodiment, all of the selected information items are displayed on the divided areas of the screen at a time. When deleting all of these information, the user can quickly confirm the information to be deleted before deletion because they are all on the screen.

[0170]

In the embodiment, the number of divided areas is set to four (4) or nine (9), the screen can be divided into more areas depending on the screen size.

[0171]

Although, in the embodiment, LCD 6 of electronic camera 1 is used as a display screen, the invention is similarly applicable to another types of display devices to divide the screen into multiple areas to display a plurality of images.

[0172]

[Advantage of the Invention]

According to the information processing apparatus described in claim 1, display control means has one or more images designated by designation means be displayed on predetermined areas of the screen. At this time, screen dividing means divides the screen into a plurality of display areas according to the number of images designated. The display control means controls so that each of the designated images is displayed one of the divided areas, thereby displaying multiple images on a screen in the efficient way.

[0173]

According to the information processing apparatus described in claim 17, designation means designates one or more images input through the image input means. The display control means controls the image size displayed on the screen according to the number of the images designated by the designation means, thereby displaying multiple images on a screen in the efficient way.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a perspective view of the electronic camera 1 to which the present invention is applied, mainly showing the front face of the camera.

[Fig.2]

Fig. 2 is a perspective view of the electronic camera 1, showing the rear face thereof with the LCD cover 14 open.

[Fig. 3]

Fig. 3 is a perspective view of the electronic camera 1, showing the rear face thereof with the LCD cover 14 closed.

[Fig. 4]

Fig. 4 shows the internal structure of the electronic camera 1.

[Fig. 5]

Figs. 5(a), 5(b), 5(c) are side views of the electronic camera 1 used for explaining the actions of the LCD switch 25 and LCD cover 14.

[Fig. 6]

Fig. 6 is a block diagram showing the electric structure of the electronic camera 1.

[Fig. 7]

Fig. 7 shows pixels of the CCD 20 for explanation of the thinning-out process.

[Fig. 8]

Fig. 8 shows pixels of the CCD 20 for explanation of another example of the thinning-out process.

[Fig. 9]

Fig. 9 shows an example of the information list displayed on the LCD 6 of electronic camera 1.

[Fig. 10]

Fig. 10 shows an example of the entire screen displaying the information list.

[Fig. 11]

Fig. 11 shows an example of image display in which four images are displayed on the screen.

[Fig. 12]

Fig. 12 shows another example of image display in which four images are displayed on the screen.

[Fig. 13]

Fig. 13 shows still another example of image display in which four images are displayed on the screen.

[Fig. 14]

Fig. 14 shows image B which was selected among the four images of Figs. 11-13 and displayed on the entire screen.

[Fig. 15]

Fig. 15 shows an example of image display when ten or more information items are selected for display.

[Fig. 16]

Fig. 16 shows another example of image display when ten or more information items are selected for display.

[Fig. 17]

Fig. 17 shown still another example of image display when ten or more information items are selected for display.

[List of the Elements]

1. electronic camera
2. finder
3. photographic lens
4. flash unit (strobe lamp)
5. speaker
6. LCD (display means)

6A. touch tablet (designation means, selection means, line drawing input means)

7. operation keys
7A. menu key
7B. execution key
7C. cancellation key
7D. delete key
7E, 7F, 7G, 7H. scroll key
8. microphone
9. earphone jack
10. release switch
11. power source switch
12. recording switch
13. continuous photographing mode changeover switch
15. red-eye reduction switch
16. photometric element
17. color measuring element
20. CCD (image input means)
21. battery
22. capacitor
23. circuit board
24. memory card (memory means)
26. in-finder display device
30. lens driving circuit
31. image processor
32. analog-to-digital converter (A/D)
33. digital signal processor (DSP)
34. CCD driving circuit
35. frame memory
36. buffer memory
37. strobe driving circuit
38. red-eye reduction LED driving circuit
39. CPU (display control means, dividing means, sound reproducing means)
40. in-finder display circuit
41. pen (designation means, selection means, line drawing input means)

42. A/D-D/A converter
45. timer
48. interface
51. photometry circuit
52. color measuring circuit
53. diaphragm driving circuit
54. diaphragm